PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

PLANTERS' BULLETIN THIRTYFOUR

CONTENTS

	Page
Stocktaking in Natural Rubber Research	1
Achieving an Optimum Stand	5
The Cost of Root Disease	11
Soil Inspection	15
RRIM '600' Clones – Second Series	22
Correspondence	14
R.R.I. News, Notes	20

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R R I

LOCATION. The institute's laboratories and offices at the third mile, Ampang Road, Kuala Lumpur are open from 8 am to 1 pm and 2 pm to 4 pm on Mondays to Fridays, and from 8 am to 12.30 pm on Saturdays.

EXPERIMENT STATION AND FACTORY. This station of the R R I is situated 16 miles from Kuala Lumpur, at Sungei Buloh on the Kuala Lumpur — Kepong — Kuala Selangor road. Visits may be made on Mondays or Wednesdays by arrangement. There is a guest house.

CORRESPONDENCE. All LETTERS must be addressed to the Director, Rubber Research Institute of Malaya, Post Office Box 150, Kuala Lumpur. Special inquiries may be marked for the attention of particular officers. The address for TELEGRAMS is Searching, Kuala Lumpur. TELEPHONE: Kuala Lumpur 3351. PARCELS occasionally arrive without any indication of their origin. Senders' names and addresses should be written clearly on the outside of all packages, and advice of despatch should be given by letter or telegram.

PROHIBITED PLANT SPECIMENS. Attention of planters and others in territories outside the Federation of Malaya and the Colony of Singapore is drawn to the Malayan Plant Importation Rules which prohibit the importation into Malaya of any part of a plant, whether living or dead, unless it is accompanied by a permit issued by the Director of Agriculture, Federation of Malaya. No permit will be issued in respect of any diseased plant or any plant pest. Any plant imported in contravention of these Rules (whose object is to prevent the introduction of diseases or pests) will be destroyed without examination. Anyone outside Malaya who desires our advice on any matter that may require examination of living material must first inquire by letter.

ADVICE. Inquiries are invited from rubber producers in the Federation of Malaya, the Colonies of Singapore and North Borneo, and the territories of Sarawak, Brunei and Nigeria, who may require more detailed information applicable to their own special problems. Where it is considered necessary, visits will be made to estates in Malaya as convenient. Visits to estates in other territories are by special arrangement. The only visits for which charges are normally made are those of our clone indentification inspectors. INTERVIEWS should be arranged by letter, as members of the senior research and advisory staff are frequently absent on visits to plantations.

PUBLICATIONS. Subscription to all or any of our series of publications (*Planters' Bulletin, Journal, Reports,* and miscellaneous booklets) may be made by depositing $15 with us. An annual statement of account will then be submitted. We are unable to give annual subscription rates or any form of discount, but for multiple subscriptions a lower rate of initial deposit is acceptable. Postage is charged on oversea mailings. A list of 'Publications of the RRI' is available on request.

PLANTERS' BULLETIN

OF THE RUBBER RESEARCH INSTITUTE OF MALAYA

Kuala Lumpur January 1958 Number 34

Stocktaking in Natural Rubber Research

Four years ago we reviewed 'Progress of Research' with respect to the five years programme of research and development which had just come to an end. At that time special emphasis was placed on the need to expand research upon the product – latex and dry rubber – of the various forms in which rubber growers prepare their crop for sale to the consumer. The Editorial in our following issue, *Planters' Bulletin 11*, posed the question 'Can Research Save Natural Rubber ?'

Again we take stock of the two parts into which the field of research for natural rubber conveniently and logically divides. First, there is research on production of the crop, which is directed towards increased efficiency at all stages: the selection of planting material, the operations of planting and cultivation, tapping, and the collection of latex. Secondly, research on the product begins at the moment when latex flows into the tapping cup; the aim is to improve the preparation, properties and presentation of the final product in order to increase both its acceptability and the range of its applications in subsequent manufacture.

PRODUCTION RESEARCH

Our readers will be well aware of the steady progress achieved in the first named field of research. Lying behind the practical information and advice which we have given in *Planters' Bulletin* are the many achievements in pursuance of our programme of research and experimental work. The development of new high yielding planting material such as the RRIM '600' series clones has advanced, alongside the study and proof of clonal seedlings for planting on a large scale. New tapping practices – yield stimulation and high level tapping in particular – are increasing the economic returns, both from mature trees in full production and from old seedling and budgrafted areas destined for replanting within the next few years.

Extensive long term field experiments have now clearly demonstrated the value of sound manuring programmes in the cultivation of rubber on virgin land and in replantings. The benefits of manuring modern high yielding rubber trees regularly with appropriate mixtures have been established with confidence on practically all soils on which rubber is grown in Malaya. Basic research over the past five years into the mineral nutrition of the rubber tree has provided reliable means for the diagnosis of nutritional disorders, and points the way to further advances in cultivation.

Good progress has also been made in the study of herbicides for eradicating weeds and for the routine control of ground covers to reduce maintenance costs in the early years of young plantings. Complementary work on improved systems of cultivation under selected ground covers is likely to be of considerable practical importance.

Although it may be long before all problems of root disease become solved, field studies have already pointed the way to considerable economies in treatment, while more fundamental research holds further promise. The problems are greatest in replanting. The elaborate control procedures which once were favoured are no longer economic but we have found, somewhat unexpectedly, that the position is improved when less digging is done. At one time the policy was to trace out every possible source of infection and to eradicate it. We are now seeking the simplest way of keeping a replanting free of disease while the root disease on the old stand wastes away.

The control of pests and diseases of any consequence, such as mouldy rot and pink disease, has been further rationalised. For some maladies our investigations have led us to advise against the use of fungicides or insecticides, but rather to concentrate on improving conditions of growth. Fortunately the leaf diseases of Malaya are by no means as destructive as those of some other countries, notably *Oidium* in Ceylon and *Phytophthora* in India. Constant vigilance is exercised to keep out pathogens that we do not have, particularly the destructive South American leaf blight.

THE PRODUCT

The other main field of our work, research on the product, is that of the chemist, the rubber technologist, the chemical engineer, and more recently the bacteriologist, This team has two aims, first to improve the quality of the standard forms of natural rubber as exported, and second to develop special rubbers with new and valuable properties.

A persistent criticism levelled against natural rubber by manufacturers has been that it varies greatly in its properties. The system of technical classification was developed to meet this criticism. Technical classification sorts rubber into three classes according to the speed at which it can be vulcanised: classification by this means eliminates extremes and greatly reduces the technical variability of the remainder. Malaya has produced an average of 30,000 tons of technically classified rubber a year over the past four years, and more than ninety per cent of this output has been tested by us. Estates can produce any one of the three classes by a suitable modification of factory procedure and the scheme can be applied to all grades of dry rubber. Whilst it is true that T.C. rubber has not been enthusiastically received by many of the largest users, chiefly because the required quantities have not been available in the market grades which form the bulk of their purchases, there is a continuing demand from other sections of the consuming industry

A higher degree of mechanisation in the factory should lead to an improved and less variable product. To this end we have studied the conditions which control the coagulation of latex and the drying of rubber, with the object of devising new methods of preparation. We have been able to advise estate engineers in such matters as adapting the standard smoke houses to new systems for drying rubber by oil firing and controlled air circulation.

We have studied the dirt content of Malayan rubber, especially sheet, and we are now ready to certify an estate's output as having a specified average dirt content should this service be required. The value of detergents in reducing dirt in remilled grades has been amply demonstrated. We have conducted shipping trials with special packing materials. Multiple paper bags or hessian with a polythene liner have proved useful when specially clean rubber is required. We have continually stressed the importance of strict adherence to bale coating specifications.

The R.R.I. bleaching process is widely used and the reduction of the proportion of yellow fraction crepe has resulted in considerable economies in the preparation of pale crepe and sole crepe.

We have continuously striven to improve the quality of latex concentrates, which form so significant a proportion of Malayan rubber production. The measurement of volatile fatty acid content has proved valuable for locating the causes of poor quality latex, and it also reveals a notable trend in the general upgrading of quality of Malayan concentrate. Whereas in 1950 most commercial latex had a VFA number exceeding 0.20, a consignment with a value greater than 0.05 on shipment is now rare. Bacteria cause volatile fatty acids to form in natural latex. Our research has revealed over 100 species of bacteria which live in fresh field latex; some are able to thrive and multiply in preserved latex. More recent research has shown that bacteria are already present in the latex vessels of the tree and more are introduced as the latex flows into the tapping cup. Further contamination occurs during concentration in the factory and indeed at each stage in the journey to the final user. Our findings underline the vital need for care and cleanliness, comparable with dairy standards, in the production of latex concentrate.

It is not even enough to kill the bacteria in latex as early as possible; dead bacteria release enzymes which lead to undesirable changes in the properties of latex concentrate. We are hopeful that research now in progress will enable us to predict and ultimately to control the behaviour of natural latex concentrates during storage. We have especially been seeking alternative preservative systems using less ammonia. A particularly successful combination is 0.2 per cent ammonia and 0.2 per cent boric acid, and certain accelerators have also proved effective. Even with a bactericide, a small amount of ammonia always seems necessary.

The high speed centrifuge has opened the way for new research into the enzymes of natural latex. With it we have been able to isolate unchanged the non-rubber substances which play such an important part in determining the technical properties of the natural product. We have also made much progress in studying how oxygen is absorbed from the air into latex and dry rubber, and its effect on properties. This knowledge has already been applied to the preparation of modified rubbers, with very promising results.

In research on modified rubbers we collaborate closely with our colleagues of the British Rubber Producers' Research Association, by testing and adapting promising new processes under Malayan conditions. For example the production of cyclised rubber, a modified natural rubber particularly suited for shoe soles, has been adapted for use in Malaya. We have demonstrated the process at our Experiment Station, Sungei Buloh, and cyclised rubber is now in commercial production on a small scale in Malaya. Graft rubbers, in which ribs of plastic are grafted on to the backbone of the natural rubber molecule, can also be made in Malaya. These new materials have special properties and the prospect of developing new outlets for modified rubbers of this type appear good.

A new form of the product knows as superior processing rubber – SP rubber – contains a proportion of vulcanised rubber and is particularly useful in the manufacture of extruded and callendered articles. This modified rubber has been made as crepe, smoked sheet and air dried sheet and may later become available in the lower grades of crepe. Production of SP rubber in the form of smoked sheet has reached 50 tons per month in Malaya and we believe that the demand will increase. Experimental preparation of SP rubber in remilled grades is progressing.

Other modified rubbers are still on the laborotary bench. We are steadily expanding the development section of our Chemical Division and improving our facilities to bring promising new materials through the stages of pilot plant preparation and user evaluation, prior to commercial development.

CONCLUSION

Our review of current research work under the broad headings of agriculture and chemistry does not imply that work goes on in water-tight compartments. Our botanists and agronomists make close contact with the chemists and rubber technologists at several points. Thus our chemists study the properties of the latex and rubber from new clones and clonal seedlings, also the effects on such properties of different manurial treatments, of yield stimulation, and of modified tapping systems, thereby assisting those whose main objective is increased economic production.

The planter may ask just how some of the work we are doing will be applied to improve his competitive position as a rubber producer. There are few doubts as to the value of better planting material and

manuring routines, of new chemical methods to reduce weeding and upkeep costs, of stimulants for raising yields, and of improved methods of processing the crop. But the need for basic research on the product itself may have a lesser appeal. Nevertheless we firmly believe that this is essential if further advances are to be made, particularly in the search for modified natural rubbers for new uses or to compete with synthetic rubbers.

It has been suggested that prospects for the commercial introduction of special forms of natural rubber are not favourable, particularly when the natural product is selling at a higher price than the synthetic. It is also argued that rubber manufacturers will themselves make modified natural rubbers if they are needed. As to the first suggestion, we would instance the growth of the foam rubber industry, based originally on the use of preserved concentrated latex – a form of natural rubber, commanding a price premium, which sprang from product research. As to the second argument, it seems far more likely that if we neglect this field then the synthetic rubber industry, with its close technical liaison with consumers, will produce the special rubbers their customers need.

Modified forms of natural rubber can succeed only if their technical advantages are worth a premium to the user, especially while the natural product costs the consumer appreciably more than the synthetic product. The prospect of short supply of total new rubber will inevitably stimulate further research and development in the synthetic industry.

For just the same reasons that natural rubber producers should increase their output so they should not neglect the possibility of increasing the versatility of their product. In the present period of apparent security, when every pound of rubber we produce may find a buyer, we should spare no effort both to improve present forms and to develop useful new types which will be needed in the future even though they yield no profit now.

Achieving an Optimum Stand

THE LAST WORD ON THIS COMPLEX problem cannot yet be said; our new appraisal takes into account recent experience and also the considerable discussion which followed the appearance of 'Planting Density' in *Planters' Bulletin 22*. The article discussed a trial which compared square planting at different distances with one triangular system at an intermediate density. From this and from other similar trials reported elsewhere we may draw conclusions.

During the first years of immaturity, growth at different planting densities varies but little until the crowns of the trees begin to meet; until then the denser plantings may perhaps have a slight advantage because less soil is exposed. When the canopy closes and competition

between trees becomes evident, individual trees develop better at the lower densities – they girth better, are ready for tapping earlier, yield more per tree, and have thicker bark renewal. Yet if the cumulative yields over a period are studied the denser plantings give a higher yield per acre, although this is obtained at the expense of lower yields per tapper and hence higher tapping costs.

Figure 1. In the foreground a tree planted in a plot of original density 48 trees per acre; in the background trees planted at 435 per acre.

Against the advantage of an increased output per unit of land under a denser planting system must be weighed the extra expense of higher tapping costs, the major single item among estate production costs.

An economic solution to the problem would call for estimates of capital and recurrent expenditure on plantings at different densities, the tapping force's wages and housing, and the necessary factory facilities. However, reasonable assumptions led to a conclusion that about 120 budgrafted trees per acre was an optimum tapping stand in the trials.

Modern clones yield more than those used in the older trials, and should therefore reduce tapping costs per pound appreciably. On first appraisal this favours denser stands, but the reduction may well come to be offset by higher wages. All probable trends considered – a falling selling price, rising costs, the use of modern planting material – a denser optimum tapping stand is unlikely. Indeed, agricultural factors favour a lower tapping density. Clones which yield well from virgin bark are prone to less vigorous bark renewal. Whilst we cannot anticipate trials to accurately determine optimum densities for present day materials, we suggest meanwhile a fairly uniform tapping stand of 90 to 100 trees per acre, to give a substantial yield at economic tapping costs and a continued good performance throughout.

ORIGINAL AND FINAL DENSITIES

The long standing practice of planting excess trees has been to provide for involuntary losses due to pests, disease and damage, although this is a secondary consideration compared with the need to remove

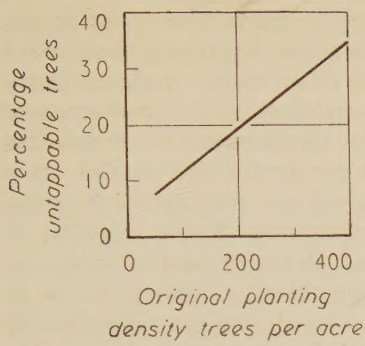


Figure 2. Percentage of trees which never reached size for tapping, at different densities.

unproductive trees by thinning. *Figure 2* shows diagramatically the percentage of trees which never reached a suitable size for tapping in our trial. Better stock selection may reduce the proportion of runts, but we recommend that the original planting density for budgrafts should exceed the desired tapping stand by 50 percent, that is 150 points per acre with modern clones to be tapped at 100 per acre, or 180 per acre for the old established medium yielding clones. This should be adequate to allow for runts and normal disease losses under good husbandry, and still leave a margin for selective thinning on yield and secondary characters such as chronic brown bast when the trees are in tapping.

For clonal seedlings, with their greater variability, the problem is more complicated but field studies have enabled us to estimate the effect of progressively thinning out the lowest yielding trees from a stand of clonal seedlings which are all in tapping. *Figure 3* shows the immediate effects on yield per acre and average yield per tree. Yield per acre and tapping costs are both reduced when the final stand is less dense, and a calculation of the maximum profit which balances these conflicting trends determines the optimum degree of thinning clonal seedlings. Such calculations have been made using estimated figures, pending experimental data, and show that the optimum is by no means sharp; over a range of original densities and degrees of thinning, the relative profit changes but little for the values of costs and prices considered. Our advice is based on field observations, and these theoretical considerations confirm that the proposed density and degree of thinning is of the right order.

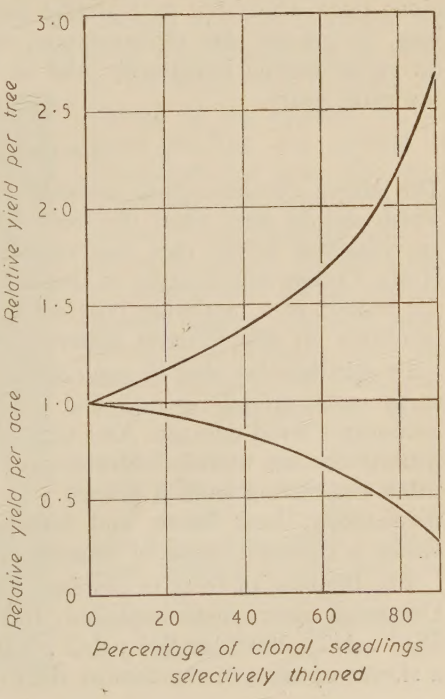


Figure 3. The immediate effects of thinning clonal seedlings by progressive removal of the lowest yielding trees.

The number of runts which never reach tappable size varies greatly among clonal seedlings, not only with the original planting density, but with family characteristics and the degree of selection on vigour in the nursery. Our general recommendation is to plant at 240 per acre and to reduce this stand during immaturity on the criterion of growth (but including involuntary losses) to 160 trees per acre at the time of opening for tapping; further thinning to 120 trees per acre should be selective on yield, over the first three years of tapping. Severe selection on vigour at planting may justify lower initial densities, and adverse economic trends will indicate further selective thinning, perhaps to 90 or 100 trees per acre. Such decisions can be delayed until the circumstances are known; it is emphasised that no exact density is critical.

Due to the high incidence of brown bast in clonal seedlings, a tapping system of S/2 . d/3 . 67% is recommended from opening, to avoid the loss of potentially high yielding trees which would result from more intense tapping during the early years.

It has been suggested that clonal seedlings should be planted at very high densities and rigorously selected on growth, yield prediction by test tapping and finally on commercial performance. This has many attractions in theory, but disadvantages in practice. Firstly it supposes an abundance of cheap clonal seed, secondly the provision of intensive supervision, and lastly the reliability of early yield prediction. Even the best methods of test tapping suffer from the selection of some precocious trees which fail to maintain performance, or succumb to brown bast. In present day circumstances we therefore recommend selection on vigour during immaturity, and on yield in commercial tapping over the early years.

THINNING

The above considerations envisage thinning as a continuous process, which should start when the trees begin to compete so that the runts are removed before they can retard the development of their neighbours. Cutting out is easier at this stage, which moreover usually marks the change in a manuring programme to larger applications, hence expenditure on unproductive material is curtailed.

Drastic thinning after its neglect is undesirable. The dense stand hitherto promotes spindly growth and the subsquent opening of the canopy encourages wind damage. Also the crowns of trees adjacent to the gaps formed become lopsided. Stresses are set up along a spiral path in the trunk descending from a branch which has grown out to fill a gap in the canopy; bark bursts and burring frequently follow the path of stress, a common cause of unproductiveness in high yielding material.

The thinning of trees in tapping is best done by gradual suppression. Unwanted trees can be exploited, and their growth checked, by tapping 2S/2 . d/2 . 200% or S/1 . d/2 . 200%. Poisoning with 2,4,5-T causes a slower opening of the canopy than does sodium arsenite poisoning or

Figure 4. LCB 1320 four years after field budding. Original planting system 20 ft × 12 ft, since thinned to 145 trees per acre. Note suppression of ground covers.

cutting out. We again draw attention to the risks of careless use of 2,4,5-T (*Planters' Bulletin 33*, page 104). An alternative method is to prune branches progressively.

PLANTING SYSTEM

The density recommendations are derived for approximately square planting systems. Such systems have a number of disadvantages. If strip weeding is employed the length of strips per acre is at a maximum and so is the exposure of the soil. Circle weeding is relatively ineffective and is therefore no solution to the problem. As the system departs from square planting through rectangular and avenue to hedge planting, the lengths of terraces to be prepared, strips to be weeded and tapping paths to be walked are reduced, although at the expense of delayed shading and control of covers between rows. The most important consideration is the relative profit obtained with the different systems. Shorter paths in avenue and hedge systems permit tapping tasks of more trees, but tapping costs per pound will only be lower provided the yield per tree is not

Figure 5. The end of a row of LCB 1320 trees four years after field budding. Original hedge planting system 80 ft × 2¼ ft, since thinned to 185 per acre. The end trees show the best growth, there is much leaning and the covers are still thick between the rows.

unduly impaired by such systems. Reports on extreme hedge planting systems show that both the yield per tree and the yield per acre during the early years are less than for square or rectangular plantings with the same number of trees per acre, so that the relative profit is likely to be less. The interval between trees in the rows at which adverse competition begins to be effective has not been accurately determined, but appears to be about six or eight feet. No severe depression in performance is noted in moderate departures from square planting.

We recommend that clonal seedlings should not be planted closer than six feet, or budgrafts closer than eight feet apart. The subsequent thinning ensures adequate freedom from the depressing effects of close planting in the rows. Thus the widest avenues recommended are planting systems of 30 ft × 6 ft for clonal seedlings, of 30 ft × 8 ft for the old established clones, and of 29 ft × 10 ft or 36 ft × 8 ft for modern high yielding clones. Minor variations to suit conditions such as planting between old rows on flat land or on existing terraces are quite acceptable. On flat land the rectangular systems have proved satisfactory, for example 20 ft × 9 ft for clonal seedlings, 22 ft × 11 ft for old clones, and 22 ft × 13 ft for modern clones.

Wide planting systems are attractive on contoured land to reduce the length of terraces, although the risks of leaning and wind damage must be borne in mind when budgrafts are established in avenues forty feet or more wide. Clones prone to such defects would anyway be a poor choice for hilly land or wide avenues. Wide avenues are necessary if it is intended to cultivate another crop between the rows of hevea, or to practice intensive soil improvement. Only under such circumstances would we encourage a departure from the recommendations given above. Even then the recommended minimum interval between trees should not be abandoned, nor the subsequent thinning. This means fewer trees planted per acre, and probably some sacrifice of yield of rubber, which may be a fair price to pay for the benefits of the second crop or the opportunity to improve the soil.

CONCLUSION

Our recommendations encourage measures to promote the best performance of the trees. Where there is doubt – for instance on how close trees may be planted in rows without defect – we advocate a cautious and conservative approach. The economic considerations are based mainly on present day conditions but we have pointed out that lower densities would be more profitable if costs rise and prices fall*. Should such adverse conditions arise after these recommendations have been carried out, there is still scope for more rigorous selective thinning programmes, or for selective tapping. Recommendations are based on compromises between many factors, and ours allow for correction under changing conditions.

* Our calculations have been based on a selling price of 85 cents (Malayan) per pound.

The Cost of Root Disease

HAVE YOU EVER attempted to calculate how much of your potential production may be lost through root disease? A precise answer to this question is not possible because an accurate forecast of root disease losses for a given field cannot be made. One is further discouraged from attempting the calculation by the need to make several assumptions and by the confusion introduced by certain imponderable factors. Even so we have attempted a general analysis, based only on yields per point and stand per acre, which we believe to give figures of the right order of magnitude. The picture which emerges provides a useful guide in answering that question which often recurs – how much may one justifiably spend on root disease control measures?

All the examples which follow are expressed in terms of a hypothetical acre. We have considered first an ideal stand of budded rubber, free from root disease and thinned to 120 trees. One hundred of these trees are tappable at the time of opening, the balance being brought into tapping within one year. Allowance for losses other than from root disease is made at the rate of one tree every third year. The postulated yields per point are based on a tapping cycle according to which two half circumference panels are tapped out from a height of 60 inches, after which the same panels are tapped on bark of first renewal. Thereafter two new panels are successively opened in virgin bark on a high cut, and the cycle is completed by tapping the high panels on bark of first renewal. The hypothetical yields are tabulated in relation to the year of the tapping cycle.

The yield per point for a given year multiplied by the corresponding stand clearly gives the total yield (per acre, as always) for that year. The figures thus calculated are not tabulated but have been used in constructing the cumulative yield curve illustrated by the ascending continuous black line in the diagram. The descending interrupted black line represents the corresponding ideal stand. The other three pairs of graphs illustrate estimates of the effect of light (blue), moderate (red), and heavy (green) disease losses. In calculating the cumulative yield figures for these conditions, the same yields per point have been taken as in the disease free stand, and the number of trees has been progressively reduced with increasing age in a manner corresponding to the way in which root disease losses occur. The rapid initial fall of the three descending interrupted curves, slowing down in later years, takes account of the fact that the rate of loss is related to the length of the perimeter of disease patches. As patches coalesce, their perimeter decreases; of further effect is the longer time taken to kill an older tree. Our experience of the extent of root disease loss under various conditions has been taken into account in deriving the figures for density of stand under different degrees of root disease incidence, and the loss of one tree every third year from other causes – as in the disease free stand – has been added in too. The final stands arrived at, after thirtyeight years of

tapping, and the corresponding yield totals over the whole productive life of the trees, are given below:

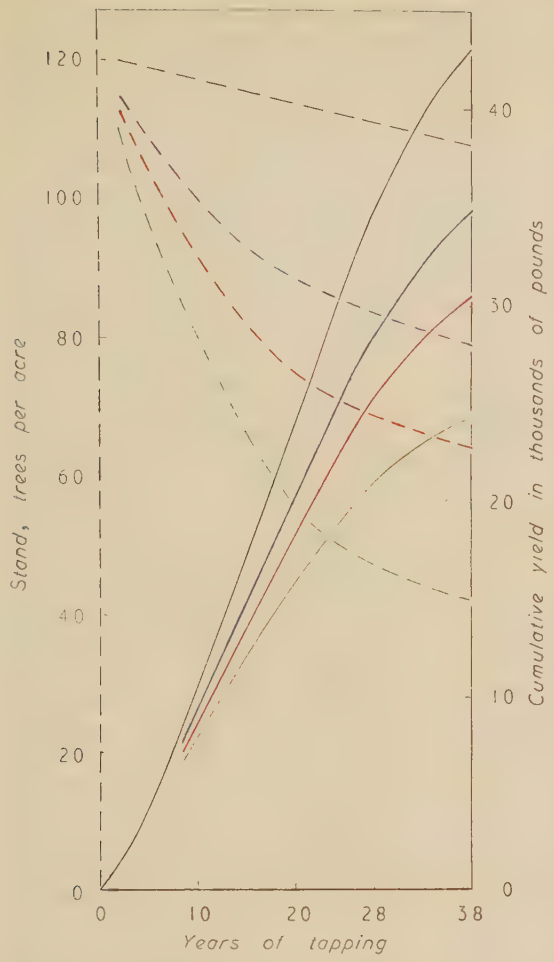
	Cumulative yield	*Final stand*
No disease	43,320 lb	108
Light disease	34,991 lb	79
Moderate disease	30,587 lb	64
Heavy disease	24,409 lb	42

What matters is not the precise figures themselves, since they are hypothetical, but the relationships between them. Thus, the potential crop losses for light, moderate and heavy disease incidence are of the order of 20%, 30% and 45% respectively. These figures may strike the reader as being surprisingly large, yet they are based on rates of loss which our experience has shown do occur. As the method of calculation is defined any reader who finds it difficult to accept our conclusions can readily find out where our postulates are at variance with his experience. We have simplified the calculations by, for example, bringing the full stand into tapping one year after opening and omitting the use of yield stimulants or slaughter tapping; such factors when applied to our four examples do not materially affect the final relationships. We may now consider in what way the representative figures for yield losses may be modified by factors which do not lend themselves to simple calculation.

Are there factors which might make the situation less serious than we have represented it? One that has been omitted is the flush yield that diseased trees sometimes give before they die, but it should be borne in mind that the flush yield may be preceded by an insidious decrease that may partly offset it. Another factor is that trees at the edges of diseased patches have more space in which to grow, and more light; hence they should grow better, and yield more; but this is true only where root disease has been controlled. We are considering the effect of uncontrolled disease, where many of the perimeter trees, themselves diseased, can derive little benefit from the reduced competition.

Are there factors which might make the situation worse than we have represented it? In the early stages of growth the most vigorous trees,

YEAR OF TAPPING	POUNDS PER POINT
First panel, virgin bark	
1	5.5
2	6.25
3	8.0
4	9.25
5	9.25
Second panel, virgin bark	
6	10.0
7	10.5
8	11.0
9	11.5
10	9.75
First panel, renewed bark	
11	10.75
12	11.5
13	12.0
14	12.0
15	11.75
Second panel, renewed bark	
16	11.75
17	11.25
18	11.25
19	11.25
20	11.0
First high panel, virgin bark	
21	12.75
22	12.75
23	12.5
24	12.25
Second high panel, virgin bark	
25	12.75
26	12.75
27	12.5
28	12.25
First high panel, renewed bark	
29	7.75
30	7.75
31	7.75
32	7.5
33	7.5
Second high panel, renewed bark	
34	7.5
35	7.25
36	7.25
37	7.0
38	7.0



which often are the best yielders, have a greater chance of catching the disease because of their more rapid root growth. In later years where root disease is extensive, further loss of production will arise from the more open stand suffering greater damage from wind; moreover, both diseased and wind damaged trees are liable to injure others as they fall.

So far we have considered the effect of root disease only in terms of production losses, but of importance also is the increasing cost of production that goes with it. The largest single item in the cost of production is for tapping. Reorganising tapping tasks is a major undertaking that is done only when the stand has fallen low enough to make it practicable and worthwhile. Up to that time the output per tapper will have been progressively falling, and the cost of production correspondingly rising. In addition, the estate's general charges, remaining at much the same level, will be spread over a smaller output, further increasing the production cost.

All in all it would appear not unreasonable to suppose that severe root disease may result in production being as much as 40% below what it could be over the whole life of a stand, while at the same time the cost of production is increased. The effects of uncontrolled root disease may be hard to find in the records for a given field. Yield figures, which are subject to variation by changes of tapping site, age of the trees, and abnormal weather, may not, for some while, show any marked downward trend: the occasional loss of one or two trees will not be

felt. If, however, tree losses are assessed in terms of potential production loss, surprisingly high figures are obtained. For example in our hypothetical ideal stand, the loss in the tenth year of tapping of one tree per acre over one hundred acres represents a potential production loss of some 27,800 pounds.

Root disease in Malaya is undoubtedly the largest single factor reducing potential yields. The best time to tackle it is while a new stand is being established. Failure to do so will delay the recovery of capital invested, reduce potential yields and increase the cost of production.

Correspondence

The Editor invites letters of general interest for publication in this column. Comment and queries arising from articles recently published will be welcome.

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EARLY RUBBER RESEARCH

The Editorial of *Planters' Bulletin 32* on 'Early Rubber Research in Malaya' made no mention of the work done by the Department of Agriculture in the days before the Rubber Research Institute came into being.

The classified list of original articles in the former *Agricultural Bulletin,* which subsequently became the *Malayan Agricultural Journal* shows that a considerable amount of the early research on rubber problems was carried out by members of the Department of Agriculture. These include Messrs Eaton, Bishop and Sharples who joined the R.R.I. in its formative years, also Messrs Grantham, Brooks, Belgrave, Milsum and others.

R.G. Heath

Director of Agriculture

Federation of Malaya

Our Editorial was not, of course, intended to be a comprehensive survey but we welcome this opportunity to acknowledge the early contributions by the Department of Agriculture, which had a responsibility for hevea – as for other crops – before the R.R.I. came into existence in 1926.

Among former staff of the Department of Agriculture, Messrs B.J. Eaton, J. Grantham, R.O. Bishop and F.W.F. Day carried out early research on the vulcanisation of rubber. Major Eaton was seconded to the R.R.I. in 1926 and later became Director. Mr Bishop succeeded Major Eaton as Head of our Chemical Division. Mr F.T. Brooks, who was later appointed to a Chair at Cambridge, did pioneer work on root diseases of rubber. Mr A. Sharples, well known as author of the standard work 'Diseases and Pests of the Rubber Tree', was seconded as Head of our Pathological Division in 1931. Mr W.N.C. Belgrave, later to become Director of Agriculture, did outstanding early work on the physiology of hevea. Mr J.N. Milsum cooperated with Major H. Gough, founder of Prang Besar Estate, on the first practical manual on budgrafting of rubber.

Our first 'Annual Report' (available still) gives an account of non-official research stations and private laboratories in being in Malaya before the R.R.I.

Soil Inspection

WE FREQUENTLY RECEIVE SOIL SAMPLES for chemical analysis and are expected on the basis of results obtained to offer recommendations concerning the fertility and planting potential of the soil concerned. The limitations have been discussed in the article 'Soil Analyses' (*Planters' Bulletin 24*) but it seems necessary to reiterate that soil analysis is only useful in certain circumstances. Visual examination of such samples can be useful but more satisfactory information can be obtained from a visual examination of the soil in situ and particularly of its profile as exposed in an inspection pit. Soil inspection pits allow easy observation of such important factors as impeded or excessive drainage, the presence of concretionary layers or of discrete layers of peat, sand and clay, and we feel that planters could make more use of this method of soil assessment than they do at the moment. The reason for patchily poor growth is often revealed when inspection pits are dug – an extreme example is given in *Figures 1, 2* and *3* – and even where specific problems do not exist the comparative fertilities of the different soils on an estate can be assessed by examining their profiles, and rational fertiliser programmes are easier to prepare.

The method of preparing inspection pits has been described in *Planters' Bulletin 24* (page 52). Briefly, the pits should be some five feet deep, about three feet square and have vertical sides; an elaboration is to cut steps into one side so that the pit can be readily entered for examination. When examining the soil there are several main points to look for. The first is the texture of the soil; by this is meant the proportions of sand, silt and clay in the soil, these proportions determining whether the soil should be classed as a sand, loam or clay or some intermediate type such as a sandy loam or loamy clay. Take a small amount of soil and rub it between the fingers; a sandy soil will feel rough and gritty to the touch whilst a clay soil, which is composed of the finest of soil particles, will feel smooth and when moist can be readily moulded in the hand. The soil texture will often vary down the profile and experience will enable the observer to attain some discrimination in identifying the many gradations possible between coarse sand on the one hand and heavy clay on other. In general the greater the proportion of sand in a soil the lower will its nutrients

Figure 1. A depression of tree vigour caused by an abrupt change in soil type. The two posts mark inspection pits A and B dug opposite trees showing good and poor growth respectively, marked by the two men.

Figure 2. Pit A. The changkol marks the junction between fine sandy loam supporting satisfactory tree growth and the infertile soil as found in Pit B.

content be and the more necessary will it be to use liberal dressings of fertilisers.

Another important point is the colour of the soil. Brown, reddish brown and reddish yellow loams and sandy loams are usually more fertile than those that are light yellow or grey in colour. Limestone and volcanic soils are rich brown in colour and not to be confused with some of the reddish brown laterite soils. Soil colour is also linked with the drainage status of the soil. Examination of the soil topography will have indicated whether drainage is likely to be abnormal or not, but sometimes the presence of impermeable layers of heavy clay or of ironstone can limit drainage even on sloping areas where drainage might be expected to be good. When the inspection pit cuts through the normal water table the latter will be indicated by a diffuse band of yellow or orange mottling. This colour is due to localised deposits of iron hydroxides formed in the soil during alternating wet and dry conditions. If the mottling exists within two feet of the surface the drainage needs improving but if no such mottling occurs or does so only diffusely in the lower soil layers then the drainage can be considered satisfactory.

The presence, near the surface, of parent rock or of concretionary layers of ironstone or laterite will also be revealed by the inspection pit. If sufficiently impenetrable these layers limit root development to the upper soil layers and the trees will suffer from nutrient and water shortage and may also be liable to wind damage.

There are of course many other factors which may not be of general occurrence but which can severely affect tree growth under local conditions. Brief descriptions of the main rubber growing soil types follow, together with details of some such local conditions which can be detected by the use of soil inspection pits.

Figure 3. Pit B, showing infertile eroded laterite soil, with ironstone boulders.

PEATS

The main body of these soils is found in coastal alluvial belts. Peat newly cleared from jungle may be several feet thick and possess a very open structure. Young hevea planted on such peats is liable to be affected by trace element deficiencies for some of which a remedy is not easily found. Peat that has shrunk and become consolidated after some years of cultivation, and soils consisting of a shallow layer of peat over alluvial clay will support better tree growth than deep virgin peat. With these soils drainage is likely to be the main factor limiting tree growth.

COASTAL ALLUVIAL SOILS

These are the heavy clays and clay loams of the Selangor series and Kelantan series. Poor drainage is the main factor limiting tree growth on these soils and is indicated by the presence of orange yellow mottling near the soil surface and sometimes by a strong smell of hydrogen sulphide from the lower soil layers exposed in an inspection pit. The permanently moist clay below the water table is blue grey in colour. A characteristic feature shown by trees growing under waterlogged conditions on these soils is the development of a white rim scorch on the leaves.

Patchy growth on these soils is sometimes associated with old pathways and line sites where soil compaction has decreased the already poor aeration of these soils to a level limiting growth. A further cause of patchy growth, and at times of severe stunting in young trees, is the presence of localised deposits of sea shells. These deposits are the residue of old beaches and can sometimes be seen on the surface or as discrete layers down the soil profile. The shells are composed of lime and render the soil in their immediate vicinity alkaline; this alkalinity has an adverse effect on the rubber tree which in extreme cases will be unable to absorb adequate amounts of iron and manganese from the soil and will show the leaf yellowing characteristic of deficiencies of these elements. Poor growth has also been observed with trees growing on localised deposits of impermeable white clay, totally distinct from the normal brown grey clay.

Young plantings on these soils are not normally manured, but the identification and delimitation of local zones of poor growth can assist in the application of special treatments to these areas.

INLAND ALLUVIAL SOILS

These include soils of all grades of texture and are deposits left by past water movements. They can be divided into three main groups.

Soils with impeded drainage (Perak series) – These soils occur in flat or gently undulating terrain and generally consist of grey silty clay loam overlying blue grey silty loam. Drainage is the main problem on these

soils, although natural drainage is rather better than on the coastal alluvial soils. Hevea on this soil will respond to normal dressings of complete fertiliser.

Soils with free but not excessive drainage (Chemor series) – These soils are yellow to reddish yellow sandy loams or clay loams and present relatively few problems. Given normal dressings of complete fertilisers. hevea will grow quite well on these soils.

Sands and sandy loams with excessive drainage (Sungei Buloh series) These range from coarse grained loamy sands to fine grained sandy loams and are possibly the least fertile of the major rubber growing soils. An inspection pit will show a brownish yellow or yellow open textured soil. and where indigenous plant growth is vigorous active roots will be found at depths of five feet and more. Nutrient levels are low and young trees require frequent applications of complete fertilisers for satisfactory growth. Freshly cleared from jungle these soils have sufficient accumulated fertility to support satisfactory tree growth during the first planting with the assistance of artificial fertilisers but replants are sometimes more difficult to establish, particularly on the grey coloured coarser phases of this series.

An alluvial soil occurring locally in low lying areas consists of light coloured coarse sand or sandy clay overlain by the peaty remains of past swamp. Freshly cleared from jungle and drained, this soil will support tree growth for some time but with impoverishment due to artificial drainage the soil becomes very infertile after some years of cultivation. Young trees and cover plants will show the leaf yellowing symptomatic of iron and manganese deficiency and great difficulty will be experienced in bringing the trees to maturity. These soils must be considered as most doubtful planting propositions; they occur patchily in the bottom lands of undulating areas and should be identified and delimited by the use of inspection pits so that appropriate planting policies can be adopted. An example of an inspection pit dug in such a soil is given in *Figure 4*.

SEDENTARY SOILS

The soils so far discussed have been the alluvial soils. The second main group of soils comparises the sedentary soils, that is those that have developed in situ by weathering of the parent material.

Soils derived from granite – There are two main series of these soils, the Rengam and the Tampin. The Rengam series is the more important: it is a deep reddish yellow sandy clay loam and occurs over a large part of the cultivated foothills leading to the main mountain range. An inspection pit will show it to be an even textured soil down the profile with no iron concretions present. Hevea grows well in this soil with the assistance of normal levels of complete fertiliser. The Tampin series is

a coarse grained sandy loam, whitish grey at the surface changing to pale yellow below. Less fertile than the Rengam series soil, it requires a liberal fertiliser programme to obtain satisfactory growth.

Soils derived from sandstone (Kedah series) – These soils are reddish yellow friable sandy loams. They support quite satisfactory tree growth but are susceptible to erosion, requiring good cover plant and terrace cultivation in hilly areas. Near hill tops the soil is likely to be shallow with the parent rock close to the surface. As with other light soils, liberal applications of complete fertiliser are required for satisfactory tree growth.

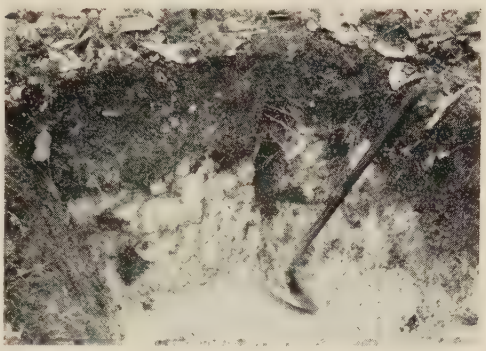

Figure 4. Black peat over white sandy clay in a recently cleared old swamp area.

Soils derived from shales and phyllites – Two main series of these soils are known, the Batu Anam and the Malacca. The former covers fairly large areas of undulating and hilly land. It is a yellow to brownish yellow silty loam over mottled silty clay, becoming grey or white with increase in depth. Sometimes a thin band of ironstone concretions is found; this can limit root development but is not a consistent feature of the profile. The Malacca series soil is a yellow to brownish yellow loam or clay loam overlying a concretionary layer varying from pebble laterite to hard masses of ironstone, like slag. The top soil is often eroded away after some years of cultivation leaving a loose pebbly layer of laterite on the surface. This soil is below average in fertility and trees require liberal manuring for satisfactory growth; a limiting factor is its low moisture retaining capacity, particularly where root development is limited by the concretionary layer.

Soils derived from schists – These soils are broadly grouped together as the Seremban series. They are yellow sandy clays over clay, containing characteristic flattened or foliated fragments of ironstone or laterite and disintegrated quartz veins. The heavier types of this soil sometime exhibit impeded drainage, the lower layers of clay being impermeable. This soil is quite fertile when freshly cleared from jungle, but it can deteriorate rapidly and a liberal fertiliser programme is required to maintain satisfactory tree growth.

Soils derived from volcanic basic igneous rocks – There are two series of these characteristic soils; they are the Kuantan series, a very deep dark reddish brown loam over clay loam occasionally containing some laterite concretions, and the Segamat series, a similar type of soil but

containing no laterite. Both possess deep uniform structure and hevea roots can be found down to six feet and more. Hevea grows well on these soils and trouble is only likely in very young plantations where the trees may suffer from water shortage, since the free draining of these deep soils rapidly dries out the upper soil layers.

The last soils that need mention are those derived from limestone, the Perlis series. These generally occur only in the neighbourhood of limestone cliffs and hevea does not grow well on them because they are neutral or alkaline.

The soil series briefly described cover only the wider range of soils on which hevea is planted. There are many subdivisions of the series that could be described, but for practical purposes the detail given should be sufficient to enable the planter to roughly classify the soils of his estate. By doing this he will achieve a greater understanding of the differing performances of his soils and may be able to find simple explanations for local variations that have puzzled him in the past.

The scheme for classifying Malayan soils in the various series mentioned above was presented in 1951 in Volume 2 of The Journal of Soil Science, as a paper by Mr G. Owen entitled 'A Provisional Classification of Malayan Soils'. Our stock of reprints is exhausted, but a 'Table of Soil Characteristics' based on the paper can be obtained (price $1) from the Department of Forestry, Federation of Malaya.

Journal

The *Journal of the Rubber Research Institute of Malaya*, Volume 15, Part 2 contains a paper by Ir P. de Jonge entitled 'Stimulation of Bark Renewal of Hevea and its Effect on Yield of Latex' which has practical significance to planters because the experiments described show that the increased thickness of renewed bark does not include more latex vessels. Nevertheless, although the work was designed to compare different treatments for bark renewal, the increase in yield which was observed at the same time has lead to intensive studies of this aspect, which continue. The experiments with clonal and unselected seedlings revealed no retarding effect on growth due to repeated application of stimulants either above or below the cut, but this work led to a recommendation that yield stimulants be used only on trees whose normal panels have been fully tapped. Treatment above the tapping cut is not recommended if this bark is to be tapped later.

The first of a series of papers on the 'Microflora of Hevea Latex', by Mr D.H. Taysum, describes a culture medium for growing bacteria from latex.

Dr E.W. Bolle-Jones and Mr R.N. Hilton examine the 'Susceptibility of Hevea Seedlings to *Helminthosporium Heveae* Attack in Relation to their Nutrient Status'; although a high level of nitrogen supply increased incidence of the disease, it is not

of course suggested that control should be obtained at the expense of vigorous growth. Our recommendations to estates to maintain a well balanced manuring programme remain. Other papers by Dr Bolle-Jones, Mr V. R. Mallikarjuneswara, and Mr K. Ratnasingam deal with analytical procedures to determine the mineral status of hevea; a study of the 'Effects of Mineral Status and Light on Rubber Formation in Hevea' has stressed the marked effect of micronutrient elements on the young plant's well-being.

Conference

Our contributions to the Ninth Pacific Science Congress, recently held at Bangkok, included a paper 'The Vegetation of Rubber Estates' by Dr P.R. Wycherley, also 'Stimulation of Yield in *Hevea Brasiliensis*' by Ir P. de Jonge, 'Improved Natural Rubber' by Mr G.W. Drake, and 'Control of *Coptotermes Curvignathus* Holmgren with Chlorinated Hydrocarbons' by Dr A. Newsam and Mr B. Sripathi Rao.

Dr Wycherley had grounds for fearing that it will become increasingly difficult to achieve a desirable succession of vegetation under present day conditions on estates. He reviewed recent botanical surveys, which justify this fear. Observations have shown how cultivation practices influence the flora. The nature of previous crops, isolation from forest, burning after clearing, and current methods of upkeep, all affect the balance of vegetation.

Ir de Jonge discussed trials in progress at our Experiment Station, Sungei Buloh. An incomplete experiment, with single cut 100% intensity tapping systems, suggests that half yearly applications may in the long run prove more profitable than more frequent applications. A major conclusion from trials with double cut 200% intensity tapping systems is that mature hevea can stand up to more intensive tapping than usual hitherto.

In short term trials on low yielding unselected seedlings, upward tapping has been compared with downward tapping. Despite an advantage for upward tapping when combined with yield stimulation, we do not recommend this method except during the last year of high intensity tapping, on account of the high bark consumption.

R. R. I. News

Over 600 hevea plants have been established after germinating 1,000 seeds which had been treated with high energy radiation. No abnormalities have yet been observed among the survivors.

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Although symptoms of mineral deficiencies of hevea, fully illustrated in colour, have been sent to most estates in Malaya (see *Planters' Bulletin 27*, page 104), no evidence has yet been forthcoming to indicate that trace element deficiency is an important problem. Clear symptoms of manganese and iron deficiencies have been observed in a few areas.

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In IndoChina, the estate of the Société des Plantations d'Hévéas de Caukhoi achieved a record production of 1,058 tonnes of rubber from 660 hectares in 1956, an average of 1,431 lb/acre.

RRIM '600' Clones—Second Series

THIS IS A CONTINUATION of the article 'RRIM '600' Series Clones' in *Planters' Bulletin 30,* in which the three large scale trials containing clones RRIM 600 to 638 were described and the records from the first year of tapping of the first group of selected clones, RRIM 600 to 618 were tabulated; the method of recording was also explained. We now present records of growth, yield and bark thickness from the large scale trial of the clones of the second selected group, RRIM 619 to 630, which completed their first year of tapping in June 1957.

Vigour – Records of girth of the clones and the percentage of tappable trees in July 1956 and a year later are listed in the table. The clones can be classified into four main groups according to the age at which seventy per cent of their trees reached a girth of twenty inches at a height of sixty inches from the union, an acceptable standard for commencing commercial tapping of budded trees. Age is reckoned from the date of cutting back the stocks in December 1950.

5 years 6 months	RRIM 623, RRIM 625, RRIM 621
6 years	RRIM 619, RRIM 620, RRIM 627
6 years 6 months	RRIM 622, RRIM 628, RRIM 501
Over 6 years 6 months	RRIM 624, RRIM 626, RRIM 629, RRIM 630

Yield – As in the previous article, yields are given both as mean yield per tree per tapping and as yield per acre per annum. To assess the value of a given clone the two types of yield record need to be examined in conjunction. For example RRIM 623 ranks fourth in yield per tree per tapping, but is easily first in yield per acre per annum because

LARGE SCALE TRIAL AT EXPERIMENT STATION RRIM 619 – 630

Initial planting distance 20 ft × 10 ft. Stocks cut back in December 1950. Stand at commencement of tapping, July 1956, 140 trees per acre.

Clone	*Mean girth* June '56*	*Trees tapped July '56* %	*Rank on girths June '56*	*Mean girth* July '57*	*Trees tapped July '57* %	*Rank on girths July '57*	*Pink disease June '55* % *trees*
RRIM 619	19.1	44	6	21.1	84	6	1.8
RRIM 620	19.4	51	5	21.3	85	5	10.1
RRIM 621	20.3	75	3	22.0	94	3	8.3
RRIM 622	18.4	43	9	20.2	71	9	6.1
RRIM 623	21.3	90	1	23.2	100	2	3.1
RRIM 624	17.7	13	12	19.4	55	13	8.8
RRIM 625	21.3	84	1	23.4	98	1	3.1
RRIM 626	17.8	14	10	19.8	56	10	2.6
RRIM 627	20.1	56	4	21.8	92	4	6.1
RRIM 628	18.6	32	8	20.3	75	8	2.2
RRIM 629	17.8	25	10	19.7	57	11	3.1
RRIM 630	17.6	13	13	19.7	65	11	2.6
RRIM 501	18.8	36	7	20.5	72	7	87.2
Mean	19.1	44		21.0			

* mean girths are measured at 60 inches from the union

LARGE SCALE TRIAL OF CLONES RRIM 619 – 630 AT THE R.R.I EXPERIMENT STATION

Initial planting distance 20 ft × 10 ft. Stocks cut back in December 1950.
Stand at commencement of tapping, July 1956, 140 trees per acre.

Clone	*Parentage of mother tree*	*Yield in first year of tapping*				*Virgin bark above panel mm*	*Rank on virgin bark*	*First year renewed bark mm*	*Rank on renewed bark*	*Brown bast*		*Rank on yield/tree in small scale trial*	
		Grams per tree per tapping	*Rank on gm/tree /tapping*	*Actual yield lb/acre*	*Rank on actual yield lb/acre*					*Cases*	*Trees tapping end 1st yr*	*1st year tapping*	*8th year tapping*
RRIM 619	RRIM 501 × Tjir 1	16.2	13	475	10	6.9	6	4.7	10	0	157	9	4
RRIM 620	RRIM 501 × RRIM 511	17.8	12	585	8	7.2	2	5.3	3	1	160	12	2
RRIM 621	RRIM 504 × Tjir 1	20.9	9	876	2	7.1	3	5.2	7	0	174	11	3
RRIM 622	Tjir 1 × Pil B84	22.8	6	649	6	6.5	9	5.3	3	1	132	6	*
RRIM 623	PB 49 × Pil B84	24.3	4	1119	1	6.3	11	4.7	10	0	188	1	*
RRIM 624	Tjir 1 × RRIM 529	32.5	1	457	11	6.5	9	5.1	8	0	103	4†	*
RRIM 625	Tjir 1 × RRIM 526	20.2	11	838	3	6.0	12	4.6	13	0	185	3†	*
RRIM 626	Tjir 1 × RRIM 500	32.1	3	482	9	7.0	5	5.7	2	0	105	2†	*
RRIM 627	Tjir 1 × RRIM 526	20.5	10	700	5	5.7	13	5.0	9	0	171	4†	*
RRIM 628	Tjir 1 × RRIM 527	32.4	2	825	4	7.1	3	5.3	3	0	140	7	*
RRIM 629	Tjir 1 × RRIM 529	21.3	7	420	12	6.6	8	5.3	3	0	106	8	*
RRIM 630	Tjir 1 × RRIM 527	21.1	8	328	13	7.3	1	6.4	1	0	122	10	*
RRIM 501	Pil A44 × Lun N	22.9	5	605	7	6.9	6	4.7	10	1	135	–	*
Mean		23.5		643		6.7		5.2					

* results unreliable owing to slashing

† six months records only

it is more vigorous and has more trees in tapping than clones RRIM 624, 628 and 626 which have given a higher yield per tree. On the other hand RRIM 626 which ranks third in yield per tree per tapping has given a yield per acre per annum which ranks ninth and is below the average for the trial as a whole.

Bark Thickness – Virgin bark thicknesses and first year's renewed bark thicknesses are given in the table. The range of both is much the same as in the trial of clones RRIM 600 to 618. It is interesting to note that of the three highest yielders per tree two have virgin bark of greater and one of less than the average thickness for this trial.

Wind Damage – There has been no serious wind damage in the trial at Sungei Buloh, but in immature trials on estates damage has occurred in several of the clones. The most susceptible appears to be RRIM 626 and the least susceptible RRIM 623 which we think might prove to be particularly resistant.

Pink Disease – None of the clones appears to be unduly susceptible to pink disease.

RRIM 623 – On the information available we consider that RRIM 623 should be added to the list of nine first selection clones given in *Planters' Bulletin 30* as promising at present. It is a clone of more than average vigour with an exceptionally attractive habit. The yield in both the small scale and the large scale trial at our Experiment Station is above average. Virgin bark and first year's renewed bark are below average. RRIM 623 appears to be resistant to wind damage.

CONCLUSION

We emphasise that these observations have been made only in one trial at the R.R.I. Experiment Station in a field of poor sandy soil which was planted with tapioca during the Japanese occupation, and that it is too early to draw firm conclusions on the relative rankings of these clones either on vigour or on yield. Nevertheless, measurements taken in immature RRIM clonal trials on estates confirm the rankings in girth at least as far as the most vigorous and least vigorous clones are concerned.

Farewell from the Editor anonymous of *Planters' Bulletin* since 1952, to all readers and particularly to the rubber planters of Malaya. That their copies have always reached them punctually at the beginning of each month of issue is largely due to the printers, who never have failed to meet schedule.

Planters' Bulletin by Airmail

Although every effort is made to see that oversea subscribers receive their *Planters' Bulletin* on the first of the month, or as soon as possible afterwards, the present transit time of about six weeks involves a delay which some of our subscribers in Europe and the Americas find inconvenient.

We therefore introduced an airmail delivery of *Planters' Bulletin* for the benefit of those who are prepared to accept the extra cost on their deposit accounts. *Planters' Bulletin* will be posted by airmail from Kuala Lumpur about four days before the publication date. We do not recommend airmail delivery to subscribers within the limits of, say, Ceylon, Australia, and the Philippines. *Planters' Bulletin* comes off the press in good time for us to send it by surface mail to these and nearer countries.

We cannot give precise airmail rates, since postal rates may change, and the size of *Planters' Bulletin* varies. It is more convenient to debit subscribers' deposit accounts. At present the airmail postage to the United Kingdom or the United States of America, is $1 (Malayan) or more on each copy.

CENTROSEMA SETS SEED WELL WHEN CLIMBING OVER A SHRUB SUCH AS LANTANA ACULEATA AS IN OUR COVER PHOTOGRAPH

By courtesy of Dr P. Wycherley

The Standard Engravers & Art Printers, 63 Campbell Road, Kuala Lumpur, Selangor